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*Original*

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# On the Convergence of Multipath Fading Channel Gains to the Rayleigh Distribution

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## Abstract

The gain of a multipath propagation scenario is addressed by this work and it is shown that the convergence to the Rayleigh distribution depends on some conditions on the path gains, which are not always satisfied. These conditions confirm the convergence to the Rayleigh distribution for some well known scenarios. However, counter-examples are also exhibited where this convergence does not hold. Furthermore, the role of the Central Limit Theorem (often advocated in the literature to prove convergence to the Rayleigh distribution) is critically discussed by showing that the Lindeberg condition *may not hold*. Finally, it is shown that the amplitude and phase of the asymptotic gain are independent and the phase is uniformly distributed over  $[0, 2\pi)$ .

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